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Swartz

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(54) **INTERNET CONTROLLED TELEPHONE SYSTEM**

(76) Inventor: **Robert Swartz**, 1066 Centerfield Ct., Highland Park, IL (US) 60035

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(51) **Int. Cl.**[7] **H04L 12/66**

(52) **U.S. Cl.** **370/352**; 379/85; 379/88.01

(58) **Field of Search** 370/352, 218, 370/235, 252, 253, 254, 255, 260, 264, 299, 321, 326, 327, 336, 353, 354, 355, 356, 357, 359, 360, 396, 398, 400, 401, 402, 404, 405, 420, 421, 422; 379/68, 69, 70, 71, 85, 88.01, 88.04, 88.27

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Primary Examiner—Douglas Olms
Assistant Examiner—Phirin Sam
(74) *Attorney, Agent, or Firm*—Charles G. Call

(57) **ABSTRACT**

An Internet controlled telephony system employing a host services processor connected to a subscriber via the Internet and further connected to the public switched telephone system (PSTN). The subscriber employs a web interface to populate a database with preference data which is used by the host services processor to handle incoming calls and establish outgoing telephone connections in accordance with the preference data provided by the subscriber. Incoming calls to a telephone number assigned to the subscriber may be automatically forwarded to any telephone number specified by the preference data. The subscriber may also use the web interface to specify whether call waiting is to be activated, to screen or reroute calls from designated numbers, for recording voice mail messages in designated voice mailboxes, for selectively playing back voice mail messages via the web interface or for forwarding voice mail as an email attachment, for handling incoming fax transmissions using character recognition and email attachment functions, and for automatically paging the subscriber when incoming voice mail fax or email messages are received, all in accordance with the preference data supplied by the subscriber using the web interface. Outgoing connections and conference calls may be initiated using the web interface, and the subscriber may block the operation of caller identification functions. Call progress information may be visually displayed to the subscriber during calls by transmitting web pages from the host services computer to the subscriber's web browser.

13 Claims, 11 Drawing Sheets

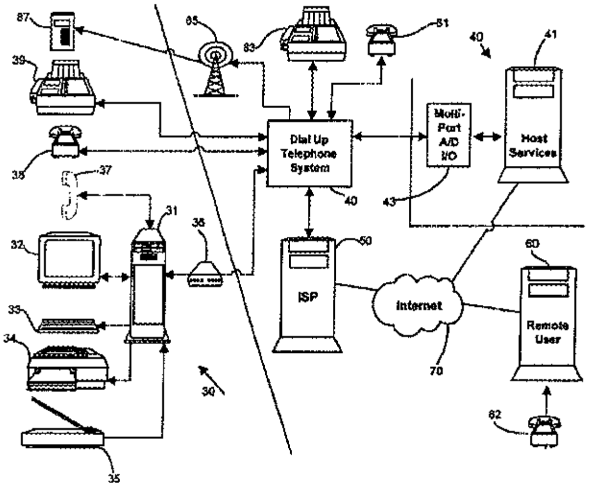


EXHIBIT 'A'

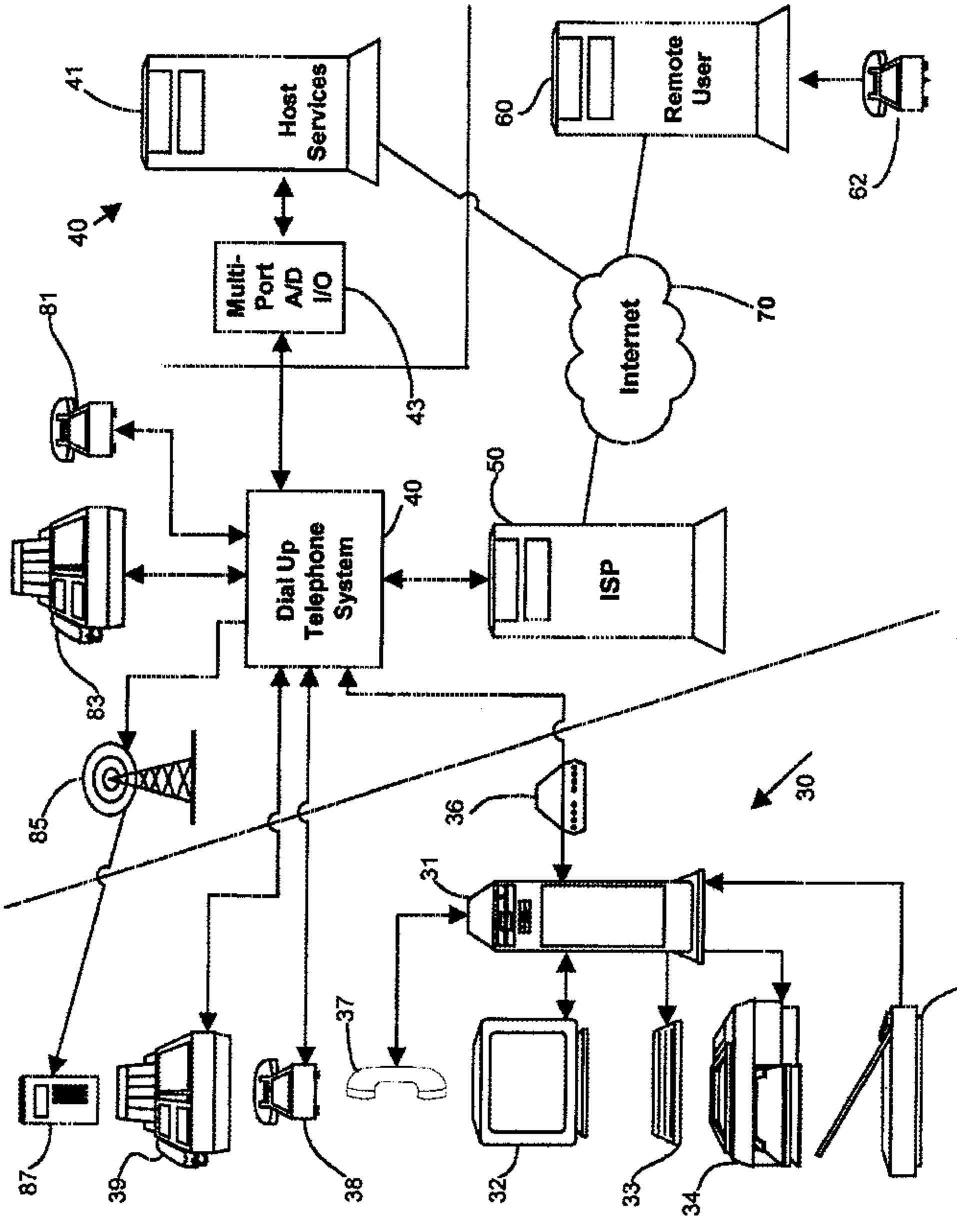

Host Services
Multi-Port A/D I/O
Dial Up Telephone System
ISP
Internet
Remote User
41
40
81
43
40
50
60
62
70
83
85
87
39
38
37
36
31
30
32
33
34
35

Fig. 1

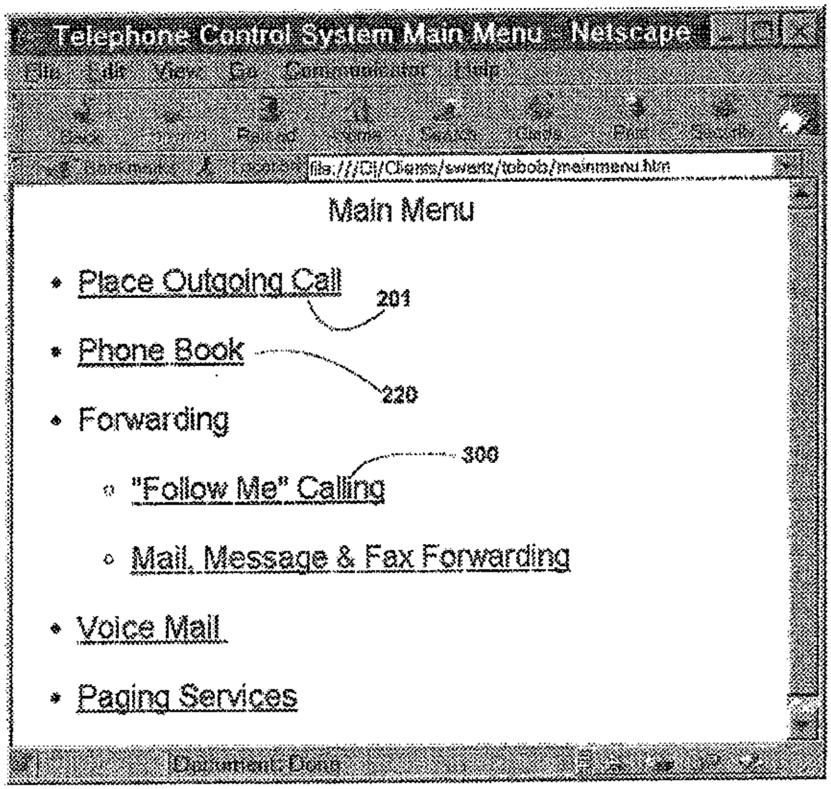
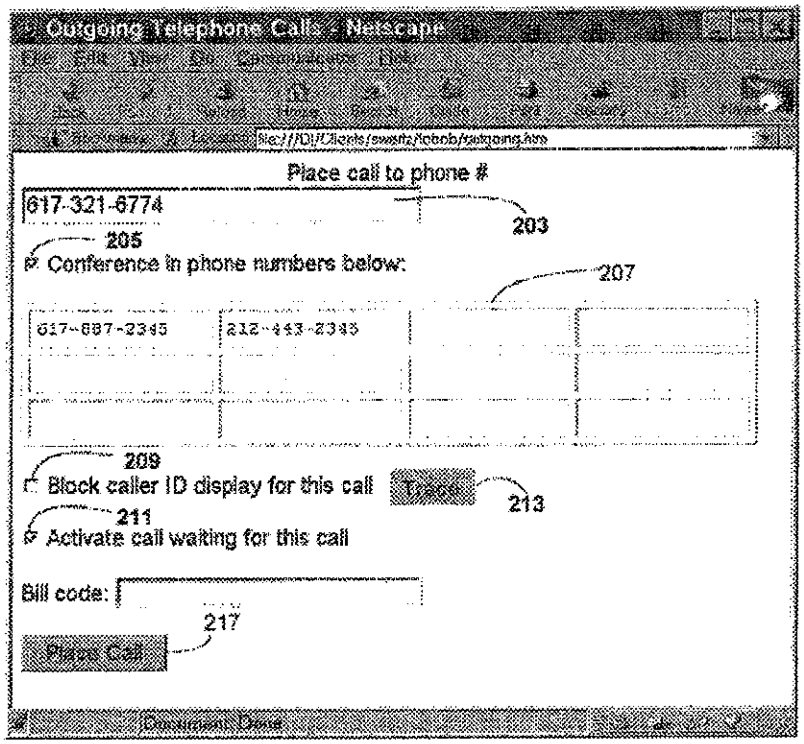

Telephone Control System Main Menu - Netscape
file:///D|/Clients/swartz/tobob/mainmenu.htm
Main Menu
Place Outgoing Call
201
Phone Book
220
Forwarding
300
"Follow Me" Calling
Mail, Message & Fax Forwarding
Voice Mail
Paging Services
Document: Done

Fig. 2



Outgoing Telephone Calls - Netscape
Place call to phone #
617-321-6774
203
205
Conference in phone numbers below:
207
617-887-2345
212-443-2345
209
Block caller ID display for this call
213
211
Activate call waiting for this call
Bill code:
217
Place Call

Fig. 3

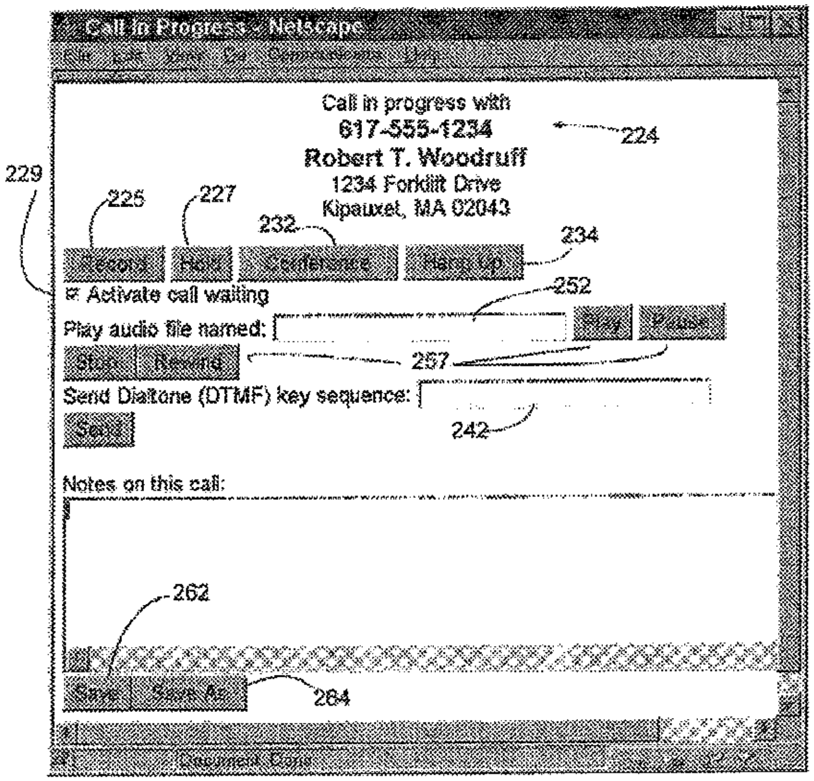

Call in Progress - Netscape
Call in progress with
617-555-1234
Robert T. Woodruff
1234 Forklift Drive
Kipauxet, MA 02043
224
229
225
227
232
234
Record
Hold
Conference
Hang Up
Activate call waiting
252
Play audio file named:
Play
Pause
Stop
Rewind
257
Send Dialtone (DTMF) key sequence:
242
Send
Notes on this call:
262
Save
Save As
264
Document: Done

Fig.4

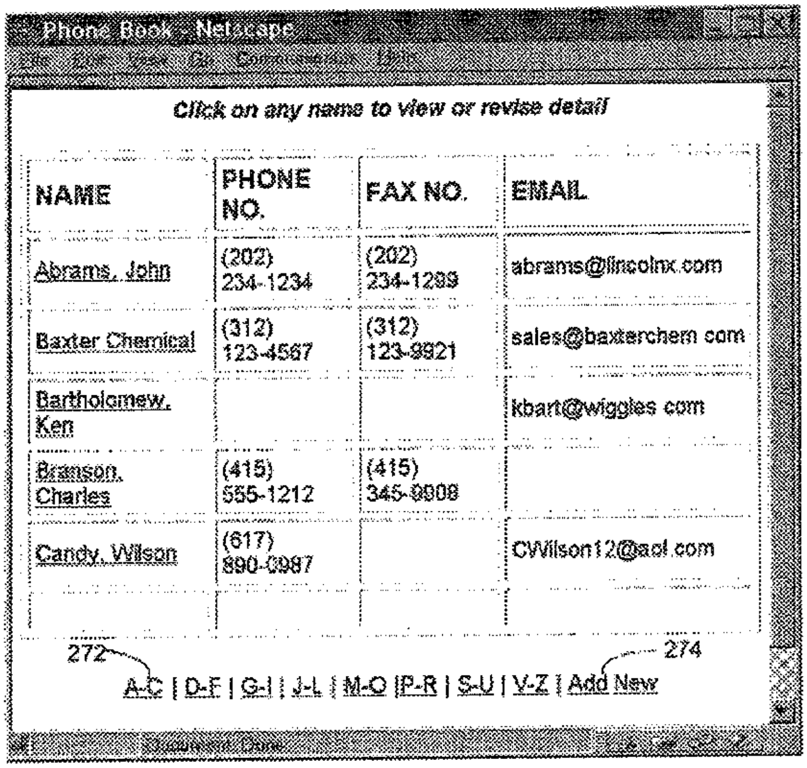

Phone Book - Netscape
Click on any name to view or revise detail
NAME
PHONE NO.
FAX NO.
EMAIL
Abrams, John
(202) 234-1234
(202) 234-1289
abrams@lincolnx.com
Baxter Chemical
(312) 123-4567
(312) 123-9921
sales@baxterchem.com
Bartholomew, Ken
kbart@wiggles.com
Branson, Charles
(415) 555-1212
(415) 345-9908
Candy, Wilson
(617) 890-0987
CWilson12@aol.com
272
274
A-C | D-F | G-I | J-L | M-O | P-R | S-U | V-Z | Add New

Fig. 5

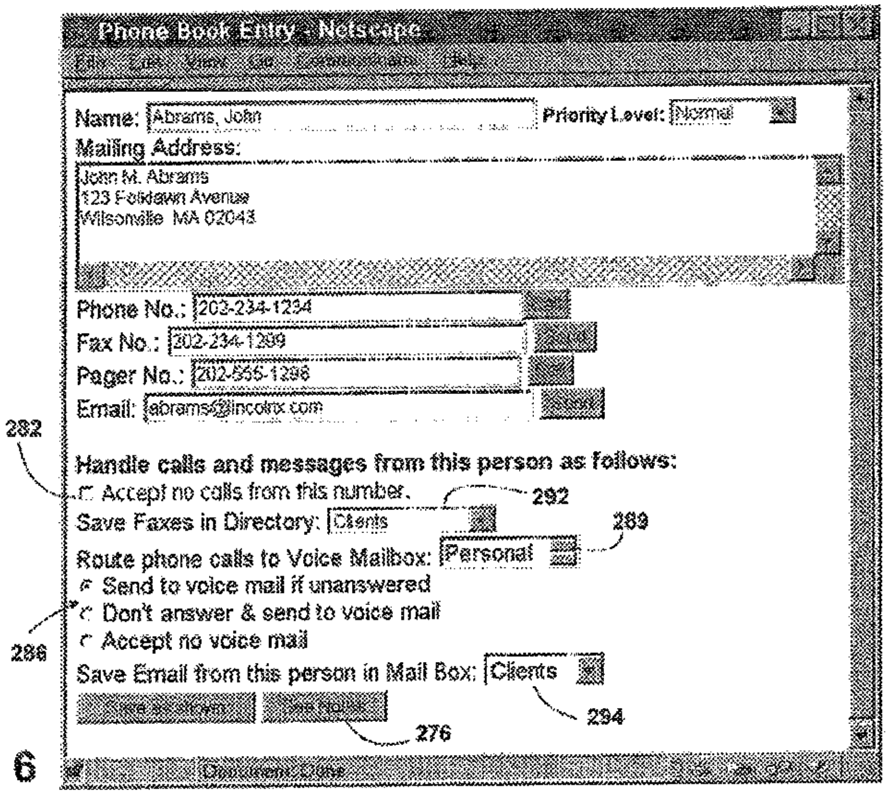

Phone Book Entry - Netscape
Name: Abrams, John
Priority Level: Normal
Mailing Address:
John M. Abrams
123 Folklawn Avenue
Wilsonville MA 02043
Phone No.: 202-234-1234
Fax No.: 202-234-1299
Pager No.: 202-555-1298
Email: abrams@lincolnx.com
Handle calls and messages from this person as follows:
Accept no calls from this number.
Save Faxes in Directory: Clients
Route phone calls to Voice Mailbox: Personal
Send to voice mail if unanswered
Don't answer & send to voice mail
Accept no voice mail
Save Email from this person in Mail Box: Clients
282
292
289
286
294
276
Document: Done

Fig. 6

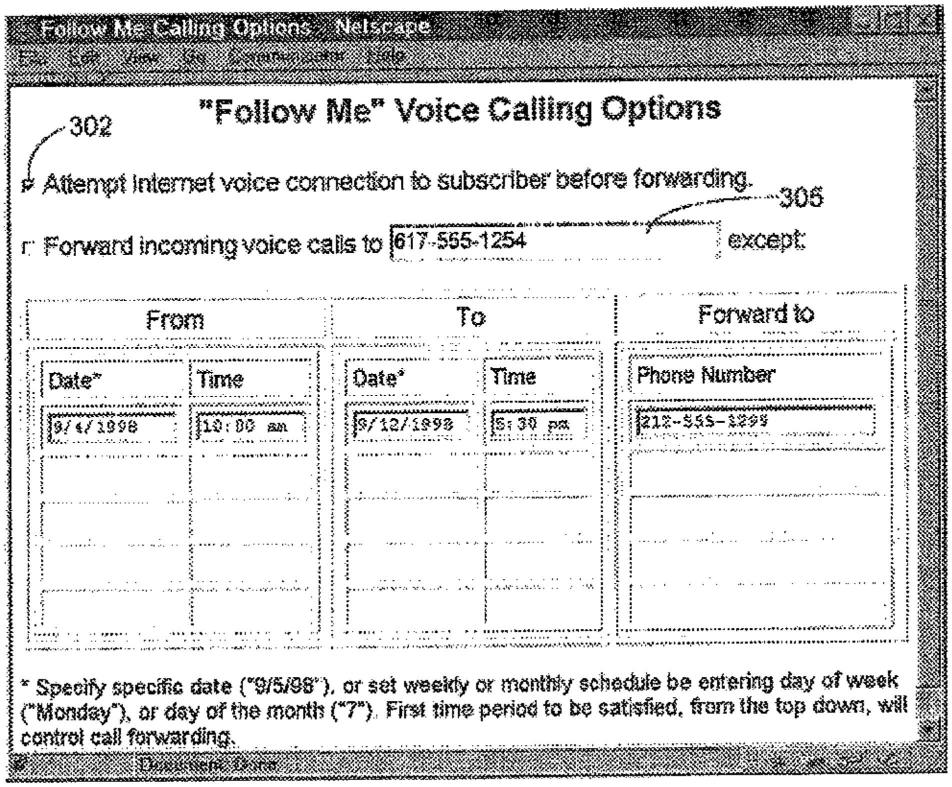

Follow Me Calling Options - Netscape
"Follow Me" Voice Calling Options
302
Attempt Internet voice connection to subscriber before forwarding.
306
Forward incoming voice calls to
617-555-1254
except:
From
To
Forward to
Date*
Time
Date*
Time
Phone Number
9/4/1998
10:00 am
9/12/1998
5:30 pm
212-555-1299
* Specify specific date ("9/5/98"), or set weekly or monthly schedule be entering day of week ("Monday"), or day of the month ("7"). First time period to be satisfied, from the top down, will control call forwarding.

Fig. 7

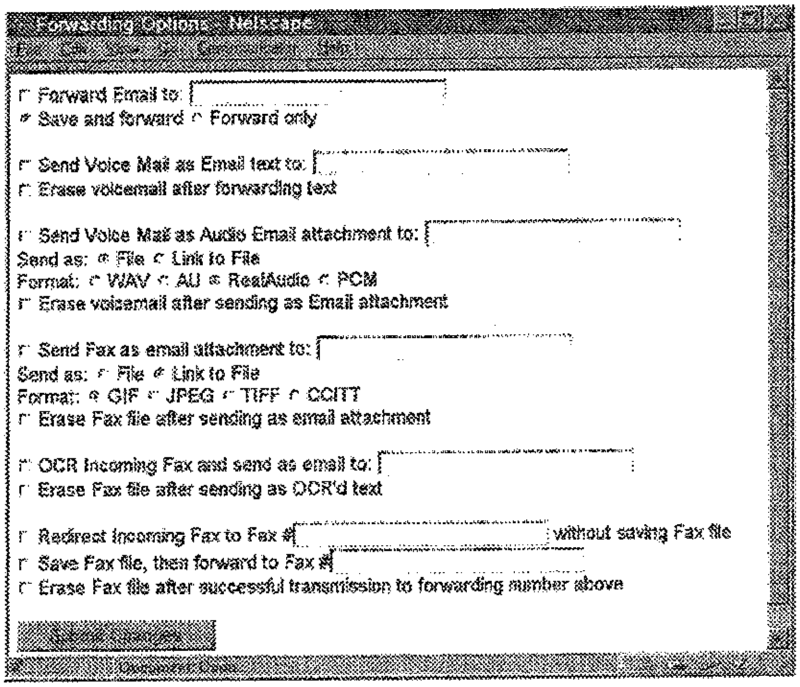

Forwarding Options - Netscape
Forward Email to:
Save and forward
Forward only
Send Voice Mail as Email text to:
Erase voicemail after forwarding text
Send Voice Mail as Audio Email attachment to:
Send as: File Link to File
Format: WAV AU RealAudio PCM
Erase voicemail after sending as Email attachment
Send Fax as email attachment to:
Send as: File Link to File
Format: GIF JPEG TIFF CCITT
Erase Fax file after sending as email attachment
OCR Incoming Fax and send as email to:
Erase Fax file after sending as OCR'd text
Redirect Incoming Fax to Fax #
without saving Fax file
Save Fax file, then forward to Fax #
Erase Fax file after successful transmission to forwarding number above

Fig. 8

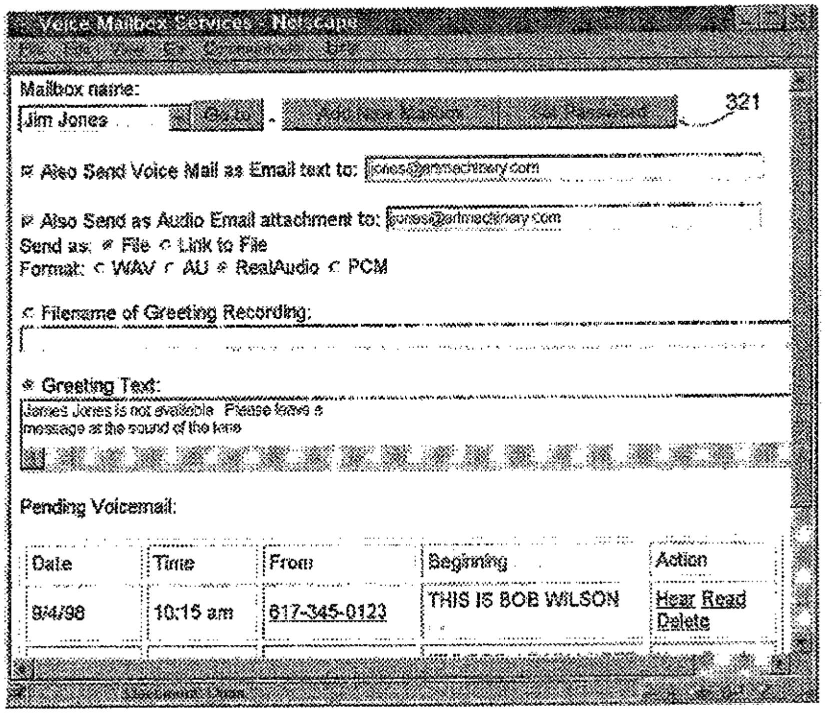

Voice Mailbox Services - Netscape
Mailbox name:
Jim Jones
321
Also Send Voice Mail as Email text to:
Also Send as Audio Email attachment to:
Send as: File Link to File
Format: WAV AU RealAudio PCM
Filename of Greeting Recording:
Greeting Text:
Pending Voicemail:
Date
Time
From
Beginning
Action
10:15 am
617-345-0123
THIS IS BOB WILSON
Hear Read
Delete

Fig. 9

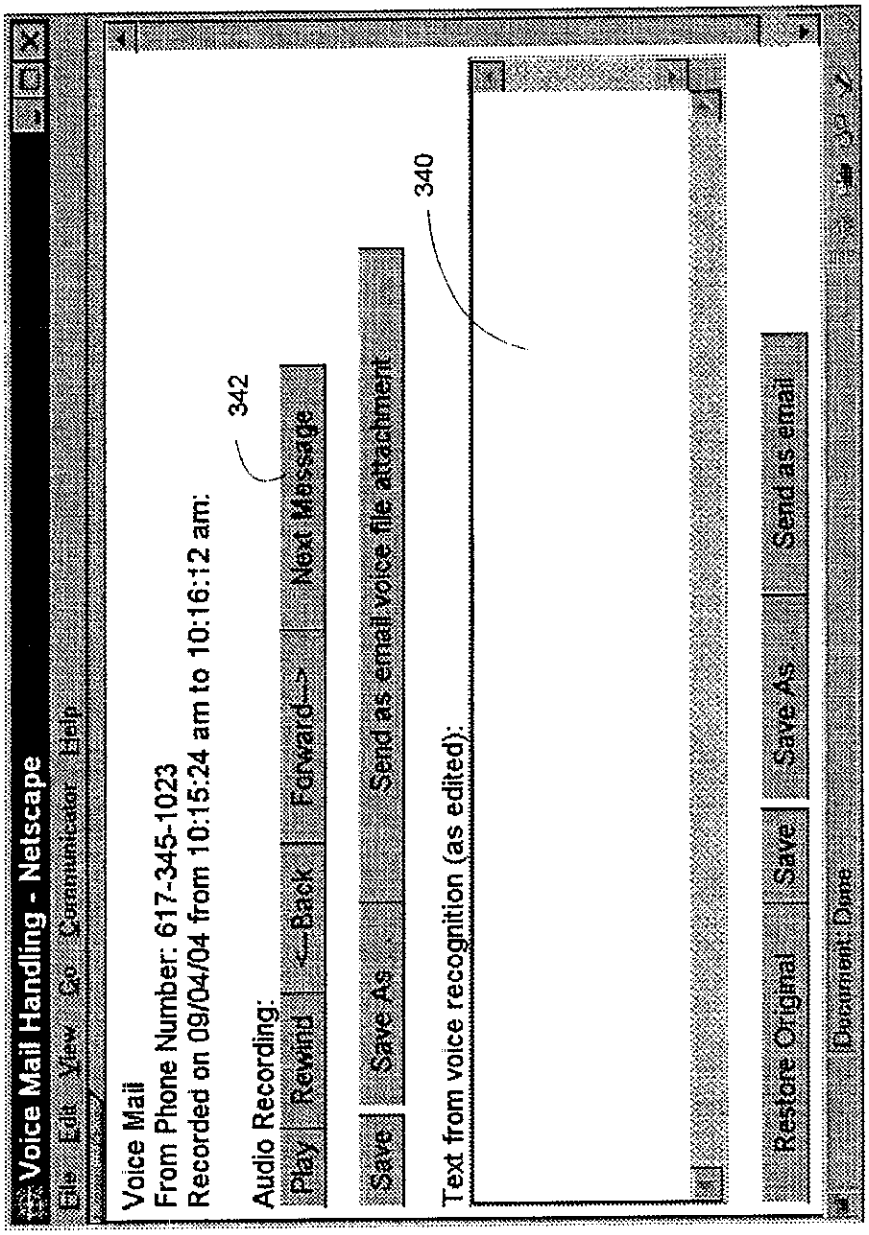

Voice Mail Handling - Netscape
File Edit View Go Communicator Help
Voice Mail
From Phone Number: 617-345-1023
Recorded on 09/04/04 from 10:15:24 am to 10:16:12 am:
Audio Recording:
Play
Rewind
<--Back
Forward-->
Next Message
342
Save
Save As
Send as email voice file attachment
340
Text from voice recognition (as edited):
Restore Original
Save
Save As
Send as email
Document: Done

Fig. 10

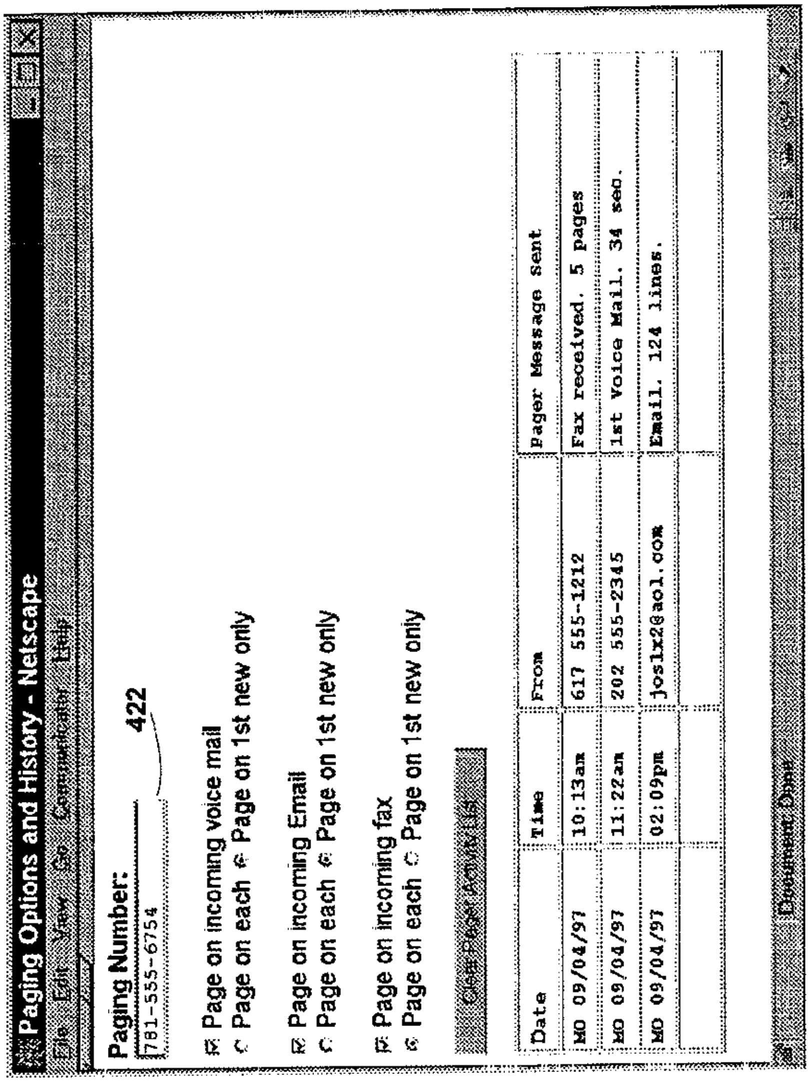

Paging Options and History - Netscape
File Edit View Go Communicator Help
Paging Number:
781-555-6754
422
Page on incoming voice mail
Page on each Page on 1st new only
Page on incoming Email
Page on each Page on 1st new only
Page on incoming fax
Page on each Page on 1st new only
Clear Pager Activity List
Date
Time
From
Pager Message Sent
MO 09/04/97
10:13am
617 555-1212
Fax received. 5 pages
MO 09/04/97
11:22am
202 555-2345
1st Voice Mail. 34 sec.
MO 09/04/97
02:09pm
joslx2@aol.com
Email. 124 lines.
Document Done

Fig. 11

INTERNET CONTROLLED TELEPHONE SYSTEM

CROSS REFERENCE TO RELATED APPLICATION

This application claims the benefit of the prior filed copending U.S Provisional Patent Application Ser No 60/040,046 filed on Mar 7, 1997.

FIELD OF THE INVENTION

This invention relates to computer controlled telephone systems and more particularly to a telephone system which may be controlled using commands transmitted from a subscriber location over the Internet to a host computer which provides telephone services

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic diagram showing an illustrative arrangement of hardware components which provide the infrastructure for implementing a preferred embodiment of the invention;

FIG. 2 shows the screen display of a main menu giving options available to the subscriber;

FIG 3 illustrates a screen displayed to enable the subscriber to place a call and request a conference call;

FIG 4 depicts an illustrative screen display which enables the subscriber to control a call in progress;

FIG 5 is a screen display presented to enable the subscriber to review and select particular persons or firms listed in a phone book database;

FIG. 6 shows a screen displayed when a form is presented to enable the subscriber to add or edit information in a phone book entry and to take place calls and the like to the person listed;

FIG. 7 illustrates a screen which is displayed to enable call forwarding and "follow me" calling;

FIG. 8 illustrates a further screen display which enables the subscriber to select and change a variety of call and message forwarding options;

FIG 9 is a screen display which enables the subscriber to create and specify features of a voice mailbox;

FIG 10 is a screen display which is allows the subscriber to view and control the playback of voice messages left in a voice mailbox; and

FIG. 11 is a screen display which enables the user to select various options and control the operation of an automatic paging system implemented by the disclosed embodiment of the invention.

DETAILED DESCRIPTION

The infrastructure used to implement the present invention may consist entirely of conventional and readily available hardware and software components. As will be seen from the discussion that follows, the hardware and software used at the subscriber (client) location is already present and in use in many well equipped home and small office computer installations. Similarly, the principal hardware and software components needed by the host services computer (server) are similarly readily available, as are the software development tools needed to prepare the limited amount of special purpose programs required for execution at the server.

FIG. 1 of the drawings shows the manner in which various conventional hardware components may be interconnected

to provide an illustrative hardware infrastructure for implementing the invention The arrangement seen in FIG 1 provides the facilities needed for controlling a variety of communications services, including telephone, email, fax and paging services provided by a host services computer operating under the control of either or both (1) a World Wide Web interface and (2) a telephone interface.

A typical subscriber location seen at **30** includes, by way of example, a personal computer **31**, a monitor **32** for displaying text and images, a keyboard **33** for entering data and commands from the user, a printer **34**, a digital scanner **35**, a modem **36** and a microphone and headset/speaker represented in FIG. 1 by the handset **37**

The modem **36** is used to establish a dialup telephone connection via the conventional telephone network **40** to a remote computer **50** which operates as an Internet Service Provider (ISP) The ISP computer **50** provides the connected computer **31** with access to the Internet, enabling the subscriber computer **31** to exchange data via the Internet seen at **70** in FIG 1 with other computers, such as the computer **41** at the host services location **40** and a computer **60** which is representative of a selected one of the millions of remote computers connected to the Internet. The dialup connection between computers **31** and **50** seen in FIG 1 is merely illustrative of one common method for connecting a subscriber location to the Internet Alternatively, the conventional modem **36** may be replaced by a cable modem, satellite connection, local area network gateway, proxy server or a connected router. All such communications facilities and the components for providing Internet access are conventional

The host services computer **41** is connected to the Internet **70** and employs a multi-port input/output (I/O) unit **43** to permit a number of outside callers to be concurrently connected via the dialup telephone system **40** The dialup telephone system **40** also provides conventional connections to a conventional telephone stationset **38** and a conventional facsimile machine **39**, both of which are provided with separate assigned lines and telephone numbers for use at the subscriber location **30**. In addition, the telephone system **40** may also interconnect any other connected telephone or facsimile machine, as illustrated at **81** and **83** respectively, as well as other services, such as a remote radio transmission facility **85** used to provide communication to a pager **87** which is assigned to and used by the subscriber Similarly, the subscriber may utilize a cellular phone (not shown) when traveling to remote locations As discussed below, the subscriber controls and uses the host service computer using these conventional instrumentalities. Importantly, conventional web browser software running on the computer **31** may be employed, along with voice commands and DTMF (dialtone) signaling via the conventional telephone hookup, to control the state and function of the host services computer **41**.

The host services computer may alternatively take the form of an Intranet server which is connected to a plurality of client (subscriber) computers by means of a local area network and/or a wide area network In addition, the host services computer may be connected via a multiport I/O device to serve a number of telephone stationsets In this arrangement, the host services computer operates as both a shared computer resource for the connected client computers and provides PBX services to the connected subscriber telephone stationsets Internet connections are provided via an Internet gateway on the LAN/WAN such that both the host services computer and the connected subscriber computers have Internet access

Note further that, with the host services computer operating as a PBS, a direct telephone voice line connection may be established between host services computer and individual telephone subscriber stationsets In this way, incoming calls may be directly connected to the called subscriber stationset without forwarding the incoming call through the dialup telephone facility. A multiplexed telephone line, such as a leased T1 carrier line, may be used to connect a plurality of subscriber phones to the host services computer, enabling the servicing of branch offices. By concentrating traffic in a shared wideband leased line, branch locations can be served through a central PBX provided by the host services computer at less cost by eliminating individual lines

The host services computer **41** may employ conventional server operating system software, such as the SCO OpenServer operating system sold by The Santa Cruz Operation, Inc. (SCO), Santa Cruz, Calif. 95061 This client/server UNIX operating system for Intel processor-based platforms includes graphical system administration and software management facilities for managing both local and remote systems The program's Motif GUI provides the look and feel of Microsoft Windows and includes TCP/IP communication gateway services for local and network access external information services The computer **41** may advantageously equipped with an enhanced audio input/output facilities, such as the Dialogic D/240SC 24 channel digital interface board which provides a voice channel interface between the computer **41** and incoming audio channels from the connected telephone lines as well as call management functions The D/240SC is marketed by Dialogic Corp. of Parsippany, N J 07054 As discussed below, it is the principal function of the host services computer **41** to receive and respond to data and commands received from the subscriber location **30**, either in the form of HTML form submissions or in the form of voice and/or dialtone commands, and to perform requested functions in response to those commands

Web Interface

A wide variety of available interface mechanisms can be utilized to facilitate communications and control between the subscriber and the host services computer As described in more detail below, a highly effective interface may be readily implemented using a conventional HTML web pages which are sent to the subscriber computer from the host services computer, including HTML forms which are transmitted to request and accept specific information from the subscriber using as "fill-in-the-blanks" input boxes, memo boxes, check boxes, and radio buttons. Javascript may be advantageously included in the HTML pages to provide validity checking of entered data by the subscriber computer Alternatively, these and other interface functions and "client-side" operations may be implemented special purpose "plug-in" programs which work with a conventional browser program, or by Java and/or Active-X applets which are transmitted from the host services computer for execution on the subscriber computer using facilities provided by the browser If desired, special-purpose client application programs may be used to directly communicate with the host services computer without using a general purpose browser.

In one particularly useful form, the functions performed at the subscriber location as contemplated by the present invention can advantageously be implemented by routines stored as dynamic link libraries which make telephone subscriber functions available through an open application program interface (API) By way of example, the widely used Microsoft Windows 95 operating system provides specifications for a robust computer/telephone interface named "TAPI" which is fully documented in the Microsoft Win32 Software Development Kit (SDK) which includes documentation, tools, and sample code to assist application programmers in adapting programs to be compatible with TAPI Two documents, the *Microsoft Telephony Programmer's Reference* and the *Microsoft Telephony Service Provider Interface (TSPI) for Telephony*, are also available from Microsoft Corp to provide additional development guidance. The programmer's reference is intended to document the functionality that an application using TAPI will need. The service provider documentation assists developers and telephone equipment vendors in writing their own TAPI services.

Telephone services are integrated into Windows using the Windows Open Systems Architecture ("WOSA") WOSA uses a Windows dynamic-link library (DLL) that allows software components to be linked at runtime. In this way, applications are able to connect to services dynamically An application needs to know only the definition of the interface, not its implementation Telephony services under Windows follow the WOSA model This means that there exists a Telephony API, which is the application programmers access to telephony services, a Telephony SPI (Service Provider Interface) which is implemented by telephony service vendors, and a Telephony Dynamic Link Library (the TAPI DDL) which is part of the Windows operating system Applications are presented with a uniform set of devices accessed uniformly via the API without needing to know which service provider actually ends up controlling which device. Similarly, service providers just execute requests on behalf of the Windows Telephony DLL; they are unaware that these requests are the result of multiple applications using the API The SPI definition reflects this single user model at the service provider level All this multiplexing demultiplexing of requests and replies is confined to the Telephony DLL In an environment with multiple PCs on a local area network, it is possible to develop applications and/or service providers that are distributed in nature With a distributed service provider, a service provider instance on one client PC is able to communicate with its peers on other client PCs, providing potentially a more powerful model as it can combine knowledge about multiple client PCs that may be involved with the same call. The services provided by the line and phone abstractions of the Telephony SPI can be partitioned into three classes:

(1) Basic Services are a minimal subset of core services They must be provided by all service providers The function contained in basic telephony roughly correspond to that of POTS. Phone device services are not part of basic telephony.

(2) Supplementary Services are the collection of all the services defined by the SPI, but not included in the basic telephony subset. It includes all so-called supplementary features found on modern PBXs including hold, transfer, conference, park, etc All supplementary features are optional This means that a service provider decides which of these services it does or does not provide. The TAPI DLL can query a line or phone device for the set of supplementary services it provides. Note that a single supplementary service may consist of multiple function calls and messages. It is important to point out that the Telephony SPI defines the meaning (i.e , behavior) for each of these supplementary features

(3) Extended Services (or Device Specific Services) include all service provider defined extensions to the SPI A mechanism is defined in the SPI, and reflected

in the API, that allows service provider vendors to extend the Telephony SPI using device-specific extensions. Since the SPI only defines the extension mechanism, definition of the extended service behavior must be completely specified by the service provider. The extension mechanism allows a service provider to define new values to enumeration types and bit flags, as well as to add fields to data structures. The interpretation of extensions is keyed off of the service provider's manufacturer ID. Special function and callbacks are provided in the SPI that allow an application to directly communicate with a service provider. Many of the control functions contemplated by the present invention which are controlled through the TAPI interface by the SPI DLL are in fact executed, as will be described, by the host services computer in ways that are invisible to the user or the application program which is executing on the subscriber computer.

As an alternative to the TAPI implementation noted above, the host services computer may present an API to programs which execute on the subscriber computers and communicate with the host computer over the Internet or an equivalent data pathway. With the remote host services computer providing an API which makes available a set of telephony functions, application programmers may implement a rich and expandable set collection of special purpose programs which execute on the subscriber computer to implement the features and functions such as those described below in the example HTML/CGI implementation of the invention. When these application programs take the form of Java applets or Active-X applets that are downloadable from the host services computer to the subscriber computer, the necessity for resident special purpose software at the subscriber location is eliminated and the cost savings associated with "thin client" network computer architectures are preserved.

HTTP/CGI Control

While such special purpose programs of the type noted above provide a high degree of interoperability with other application programs, they must be specially loaded for execution into each subscriber computer. By using the capabilities found in existing web browser software, it is possible to provide the desired functionality with no new software of any kind being required at the subscriber location. Thus, in perhaps its simplest form, the present invention can be readily implemented by using a conventional web browser program (e.g. Netscape Navigator or Microsoft Explorer) which executes on the subscriber computer **31** seen in FIG. **1**, and conventional web server software (e.g. BSD Unix 2.2, Apache 1.1.1) or an SQL server which interoperates with a relational database (such as the Sybase SQL Server V.11). On the server side, web page requests or form submission from the subscriber computer's web browser are sent to the host services computer **41** using the HTTP protocol. At the host services computer **41**, the received transmissions from the subscriber location may be handled by Common Gateway Interface (CGI) programs which typically process information from the subscriber and return HTML pages for display on the subscriber's web browser. The HTTP/CGI interface infrastructure is conventional and is described, for example, in *Developing CGI Applications with PERL*, by John Deep and Peter Holfelder, John Wiley & Sons (1966), ISBN 0-471-14158-5.

To establish a working relationship between the host services computer and the subscriber, the host services computer makes available to the public at large a "home page" at a predetermined URL (Universal Resource Locator). The home page, when displayed, identifies and makes available descriptive information about the system, inviting members of the public to subscribe to the offered services by displaying, completing and submitting a subscription form.

The HTML subscription form shown enables user to establish an account with the operator of the host services computer. When the subscription form is submitted, the host services computer stores the descriptive information entered on the submitted form in persistent storage (typically a database on a local magnetic disk drive) accessible to the host computer. As is conventional, the subscription process may advantageously employ conventional secure encrypted communications protocols for obtaining the subscriber's credit card number and authorization to facilitate billing. As will be understood, the subscriber may be billed for services based on monthly fees or measured use of the system at rates which, because of economies achieved by the system, may be significantly lower than the costs associated with such services when provided by conventional means. When the subscription form is received and accepted, the new subscriber may be sent a user ID and password (which may be done by conventional mail at the same time user manuals or other information is supplied to the subscriber).

In accordance with an important feature of the invention, the subscriber can access his or her personalized phone services and database from any computer having access to the Internet, and need not be limited to a particular computer on which special programs or data are stored. At the same time, the password protection afforded by the system assures the security of the information stored for access by the subscriber. The host services may be advantageously provided by an existing services provider, such as an Internet Services Provider (ISP), a cable modem company, a telephone access provider, an telephone answering service, a paging services company, or the like.

At the same time the new subscription account is established, the host service assigns a telephone number to the new subscriber service and informs the subscriber of that assigned number (which may conveniently be an 800 or 888 number, eliminating the need for the subscriber to independently obtain 800 or 888 number service). This telephone number will be referred to hereafter as the "assigned subscriber number". Any call to the assigned subscriber number is answered by and handled by the host services computer **41** in the manner determined in part by preference data provided by the subscriber using HTML forms as described in more detail below, or by transmitting voice or DTMF commands over the conventional telephone system.

Using the web browser software running on the subscriber computer **31**, the subscriber accesses a predetermined (and typically bookmarked) web page at a predetermined URL. The host services computer responds with a request to the subscriber to enter his or her assigned user ID and password, and if that step is performed satisfactorily, the host services computer transmits a main menu webpage of the type illustrated in by FIG. **2**.

The main menu page seen in FIG. **2** provides hypertext links to six different web pages, each of which is also illustrated in the drawings as shown by the table below:

Menu Anchor Text	Drawing
Place Outgoing Call	FIG. 3
Phone Book	FIG. 5

-continued

Menu Anchor Text	Drawing
"Follow Me" Calling	FIG. 7
Mail, Message & Fax Forwarding	FIG. 8
Voice Mail	FIG. 9
Paging Services	FIG. 11

Place Outgoing Call

When the subscriber "clicks on" the anchor text "Place Outgoing Call" at **201** on the main menu webpage seen in FIG. **2**, the browser sends a request for a further webpage specified by a URL associated with the anchor text in the HTML text which created the main menu.

Note that, in general, the value of a URL sent when a hyperlink is activated is the file location of web page or a predetermined CGI script, along with parameters passed to the server for execution by that script. Note that, in general, because the hypertext links (URL's) that are sent to the server are formed from text on pages written by the server, the URL may contain state information, either in the form of a file designation or in the form of CGI parameters, which identify the subscriber as well as the context in which the subscriber is making a request, and the specific request or data being sent to the server

The selection by the subscriber of the main menu option represented by the hypertext anchor text "Place Outgoing Call" causes the HTML for displaying the form seen in FIG. **3** to be displayed by the browser. This form allows the user to enter a phone number to be called in the input line form control at **203**. In addition, by clicking on the checkbox at **205** and entering one or more numbers in the input line boxes arrayed in a table at **207**, the subscriber may specify the telephone numbers of additional parties to be included in a conference call The conference call may be implemented directly by the host services computer **41** which places all calls to all of the numbers specified in the form seen in FIG **3**, or the conference call may be requested from the dial up telephone system

Control of Telephone Central Office Services

Most public telephone services offer a variety of service functions which can be advantageously implemented using the user interface features of the present invention. To use many of these functions, the user must normally know and key-in control key sequences on the telephone keypad In accordance with a feature of the present invention, these functions may be advantageously automated by the host services computer in response to easily understood menu selections made by the subscriber using the webpage interface or voice command interface The conventional telephone system functions which can be advantageously implemented in this way include those shown in the following illustrative examples, described using the control dialtone key sequence command codes employed by the Bell Atlantic telephone service. These functions include the activation and deactivation of call waiting services under the control of the HTML checkbox form control seen at **211** in FIG **3**, the blocking and unblocking of caller ID displays in response to the checkbox entry at **209** in FIG. **3**, and the activation of call tracing

As an alternative to the use of DTMF key sequences to control telephone central offices, the SS7 call management protocol may be used AT&T developed and made available a set of 1A ESS features called LASS (Local Area Signaling Services). As expanded by customized software enhancements originating with Pacific Bell, these functions are also available under the name CLASS (Custom Local Area Signaling Services) These services allow increased customer control of phone calls Existing customer lines can be used provide call management and security services. A key feature of CLASS resides in the ability of the terminating office to obtain the identity of the calling party. Special terminating treatment based on the identity of the calling party can then be provided The CLASS features are dependent upon an SS/CCS (Signaling System 7/Common Channel Signaling) network and use the SS7 Call Management Mode of operation. SS7 is an advanced signaling system that features flexible message formatting, high speed data transmission (56/64 kbps) and digital technology. CCS is defined as a private network for transporting signaling messages In the existing voice and signaling network, signaling and voice use the same path but cannot use it at the same time With SS7, signaling and voice have been separated Signaling (SS7) is over a high-speed data link which carries signaling for more than one trunk In the context of the present invention, the SS7 protocol provides a more direct and effective way for the host services computer to control the functions of the connected dialup telephone system than the conventional DTMF signaling mechanisms which are set forth here for simplicity.

If the subscriber wishes to prevent the called parties caller ID system from displaying the subscribers number on the next call, the box at **209** is checked and the host services computer requests the central office to perform per call blocking by sending the dialtone sequence "*67" to the central office If the telephone company has been requested to block caller ID display on all outgoing calls, the line associated with checkbox **209** would instead read "Unblock display of your number by caller ID for next call only" and the host services computer would instead sends the sequence "*82" to remove perform line blocking for the next call only. The host services computer can interrogate the central office to determine whether or not line blocking has been requested by dialing a predetermined number which will provide an announcement indicating line blocking status for the calling number

The functions noted above may be performed by the telephone central office in response to command codes sent from the host services computer to the central office Call waiting is activated when the checkbox at **211** is checked by sending the key sequence "*70" to the central office, and is deactivated by the sending same code when the box on line **211** is unchecked.

If only one additional party is to be conferenced in, the commonly available "three way calling" service offered by telephone system may be used. When the user enters the telephone number of the third party to be added to an existing call at **207** and checks at **205**, the host services first dials the number entered in input line **203** and, when that connection is established, the computer flashes the line (i e , places the line on-hook momentarily), waits for three beeps and a dial tone from the central office, dials the number previously entered at **207**, and when the added party answers, again flashes the line to bring all three parties together for the desired conferenced call. If the third party line does not answer or is busy, the subscriber is notified of that condition and the line is flashed twice to reconnect the first call

When the button **213** on the form seen in FIG **3** is pressed, a command is sent to the host services computer request a trace of the last incoming call. In response, the host services computer returns a form (dialog box) advising the subscriber of a service charge will be incurred and requesting confirmation that the requested function should nonetheless be performed. If confirmed by the subscriber, the host services computer transmits the dialtone key sequence "*57" to the central office, which thereafter provides announcements to the subscriber indicating that the call was traced and providing further instructions.

After the information in the input line **203** identifying the number to be entered is completed, and optionally the conferenced-in numbers are entered at **207**, the user presses the button labeled "Place Call" at **217** In response, the server dials the call to establish a voice connection with the called party or parties, and displays the call-in-progress form seen in FIG. 4.

As the call progresses, the normal audible signals (busy signals, ringing signals, etc.) are sent to the subscriber over the telephone voice connection, and may be supplemented by additional voice status announcements Typically, such notifications to the subscriber may be sent by sent by both voice announcement and audible signals over the voice connection or by sending status displays in the form of revised HTML pages for display on the subscriber's monitor In accordance with the invention, notification messages displayed on the monitor are frequently less disruptive; accordingly, by checking the checkbox seen at **223** on the form of FIG 4, the subscriber may disable the supplemental voice announcements.

The full identification of the incoming party is displayed on the call-in-progress form as indicated at **224**. To provide this complete display, the host services computer matches the telephone number of the calling telephone, provided by the telephone system's automatic number identification (ANI) service, against a "phone book" database (to be discussed later) of frequently used phone numbers to obtain, in addition to the ANI information, other descriptive information about the calling party The name or number of the calling party may form the anchor text for a hyperlink to even more detailed phonebook information about the party of the type to be discussed later in connection with FIGS **5** and **6**.

When the subscriber places a call to a busy line, or if there is no answer before a time out period expires, the host services computer presents a dialog box form to the subscriber showing the status ("No Answer" or "Busy") and displaying a request prompt "Continue automatic redialing?" [Yes, No] If redialing is requested, it may be performed by the host services computer or, in the alternative, the central office may be requested to perform repeat dialing by sending the key sequence "*66". Repeat dialing by the central office may be deactivated on the request of the subscriber by notifying the host services computer which, in turn, transmits the dialtone sequence "*68" to deactivate central office repeat dialing

Other call in progress controls which are provided by the call-in-progress form of FIG 4 The button **225** labeled "Record" may be pressed to create a recording of the conversation, preferably by first generating a confirming dialog box and, if desired, informing the called party by voice announcement or signal, as appropriate, that the conversation is being recorded By pressing the "Hold" button **227**, the call in progress may be placed on hold in the normal way so that, for example, a incoming call signaled by the "call waiting" function can be handled. So that more important calls or data connections are not interrupted, call waiting may be deactivated by checking the checkbox at **229**. By pressing the button **232** labeled "Conference," the subscriber may request to have additional parties included in a conference call, which is accomplished by again displaying the outgoing call specification form seen in FIG. **3** The subscriber may terminate a call by simply placing the handset on hook in the usual fashion, or by pressing the "Hang up" button **234** which has the same effect

It is frequently desired to send a predetermined DTMF key sequence after a connection is established in order to perform specialized functions In addition, it may be desirable to play a predetermined audio file so that it can be heard by the party with whom a connection has been established To send a DTMF key sequence, it may be entered in text in on the input line at **242** and then sent by pressing the form button **246** labeled "Send." Similarly, the filename or other designation of an audio file recorded at the server computer **41**, or the URL of an audio file available on the Internet, may be entered in the input line at **252** The designated audio file is sent over the voice telephone connection under the control of the buttons at **257** labeled "Play," "Pause," "Stop" and "Rewind."

For the convenience of the subscriber, notes on the call in progress may be entered in the memo box seen at **262** in FIG **2**. Pressing the "Save" form button at **264** causes the entered notes to be saved as a file at the server at a location accessible by accessing the phone book entry for the party as discussed in connection with FIG **6**. Alternatively, by pressing the "Save As" button, the subscriber is presented with a form that enables the notes to be saved at a named location on persistent storage accessible to the host services computer Note that such information is saved at the host services computer **41** and not at the subscriber computer **31** so that the information saved is available to the subscriber regardless of the particular client computer used to access the system. It is an important feature of this aspect of the invention that subscriber may access his or her personal information from any location using any web browser and/or telephone subscriber station, such as a public telephone at an airport.

Phone Book

Frequently called numbers may be accessed and dialed using a phone book database of information By clicking on the hyperlink anchor text "Phone Book" seen at **270** on the main menu of FIG. **2**, a phone book listing page illustrated in FIG **5** may be displayed. This listing displays an alphabetical list of persons and firms previously stored by the subscriber. Using the page designating navigation bar listing seen at **272** in FIG. **5**, the subscriber may go to any desired subsection of the phone book to find an existing listing. By clicking on the name of the person or firm of interest, a form containing more detailed information is presented as shown in FIG **6** If the person of interest is not found on the listing of FIG. **5**, the hyperlink anchor text "Add New" at **274** at the right side of the navigation bar **272** may be clicked on to display a blank for of the type shown in FIG **5** to enable a new entry to be created.

The form seen at FIG **6** accepts and, when submitted, stores information about frequently called numbers and is the source of database information displayable at **224** in the call-in-progress form Notes saved during previous conversations with the person identified on the form may be viewed by pressing the button labeled "See Notes" at **276** in FIG **6** Note that this button will only be present when notes have been previously recorded for that person or firm; otherwise, the CGI script which generates the form in response to the activation of the associate hyperlink on the form of FIG **5** will not include the button on the generated form. The phone book data itself may be advantageously stored using a conventional SQL server which interoperates with a relational database (such as the Sybase SQL Server V.11)

The database for each called number potentially includes not only the phone number for that party, but also fax and pager numbers and email addresses. Phone calls, fax transmissions, paging transmissions and email messages may be initiated immediately from the form seen in FIG. 6 by pressing the appropriate one of the activation buttons seen at **280**. In addition, by checking the checkbox at **282**, calls originating from this caller may be screened and blocked altogether, or may be routed to voice mail according to the instructions provided by the subscriber selectable radio button options indicated at **286**. The drop-down list box at **289** permits the subscriber to designate the voice mailbox to which voice mail from this caller is directed. Similarly, the drop-down list boxes at **293** and **294** respectively allow the subscriber to designate the mailbox locations for fax transmission files and email messages received from this caller. When the form is completed to the subscriber's satisfaction, the information it contains is saved for future use in the database maintained by the host services computer when the subscriber presses the "Save as Shown" button **299** at the bottom of the form of FIG. **6**.

Call Forwarding

When hypertext option **300** is clicked on the main menu form seen in FIG. **2**, the form seen in FIG. **7** is displayed on the subscriber's monitor. This form allows the subscriber to specify the manner in which incoming calls are forwarded and implements "Follow me" call forwarding to enable calls to be automatically forwarded to one of plurality of different numbers in accordance with a predetermined time schedule.

First, at the times when the subscriber is using a particular computer, he or she may place a checkbox at **302** to instruct the host services computer to attempt to establish a voice connection via the Internet using IP telephony to the IP (Internet Protocol) address being used (during this session) by the subscriber computer. IP telephony uses the Internet to send audio between two or more computer users in real time, so the users can converse, and offers the ability to combine voice and data on one network. IP telephony also offers low-cost long distance "telephone" service (assuming the user already has a multimedia PC and a fixed-rate Internet service provider [ISP] account). IP gateways bridge the traditional circuit-switched telephony world with the Internet and offer the advantages of IP telephony to the most common, cheapest, most mobile, and easiest-to-use terminal in the world: the standard telephone. The gateway takes the standard telephone signal, digitizes it (if it is not already digital), significantly compresses it, packetizes it for the Internet using Internet Protocol (IP), and routes it to a destination over the Internet. The gateway reverses the operation for packets coming in from the network and going out the phone. Both operations (coming from and going to the phone network) take place at the same time, allowing a full-duplex (two-way) conversation. Gateway products which may be used at the host services computer **41** are conventional and may be obtained from Dialogic and other vendors, and are compatible with client (subscriber) software which enables the connected subscriber computer to receive and send voice signals over the IP connection. When IP telephony is used, the subscriber uses the handset **37** for voice communications with the handset **37** being connected to the soundcard of the subscriber PC; otherwise, the handset is connected to the telephone subscriber line (which may be shared with the modem **36** for data).

If the checkbox **302** is not checked, the host services computer uses the Internet connection for control functions, but establishes a voice connection via the conventional dialup telephone line. Normally, the host services computer

is directed to forward calls to the number entered in the input box at **305** in FIG. **7** except when a time period specified by the four leftmost columns in the table at **310** is satisfied, in which case incoming calls are instead forwarded to the number in the associated right hand column.

The host services computer activates call forwarding by taking the line carrying the incoming call off-hook, sending the key sequence "#72" to the central office and, when dial tone is received from the central office, dialing the forwarding number previously entered by the subscriber on line **2**. When the called number answers, call forwarding is activated; otherwise, if there is no answer or a busy signal, a dialog box (not shown in the drawings) is displayed on the subscriber's monitor (if active), asking the subscriber if the attempt to activate call forwarding should be attempted by redialing until canceled.

Message Routing

The subscriber may control the manner in which Email, voicemail and fax transmissions are handled using the form seen in FIG. **8**. To effect email handling, the host services computer operates as a POP mailbox and SMTP server for receiving and sending email respectively. In order to coordinate email, voicemail and fax transmission, the host services computer may advantageously employ a set of conventional format conversion functions including: voice to text speech recognition for converting voice mail into text form suitable for transmission via email as well as by voice file MIME attachments to email; optical character recognition for translating fax transmissions into text form for email transmission as well as by MIME fax file attachments to email. The information provided on the form of FIG. **8**, which is self explanatory, allows email, fax and voice mail messages to be forwarded, stored, and redirected in a variety of ways in response to option selections made by the subscriber as shown.

Similarly, the form seen in FIG. **9** provides a mechanism for establishing voice mail mailboxes and governing special functions performed by each. As seen at **286** in FIG. **6**, incoming calls from persons or firms identified in the phone book database may be automatically routed to voice mailboxes designated using the form of FIG. **9**. This form allows the subscriber to set a password or pin number (set and reset by pressing the button at **321**), to automatically save and/or forward voice mail routed to this mailbox to specific directories or recipients, and to.

The voice mailbox form seen in FIG. **9** further displays a listing of all undeleted voicemail received by this mailbox, along with the date and time recorded and the identification of the caller. By pressing the hypertext link "Review" seen at **333** in FIG. **9**, the host services computer sends the HTML page seen in FIG. **10** which displays the voice recognized text of the selected message at **340** and enables the subscriber to control the audio playback of the message using the HTML buttons seen at **342**. In addition, the form seen in FIG. **10** enables the subscriber to save the voice mail message as an audio file or send it to as a voice file MIME attachment to email. Similarly, the voice recognized text may be edited by the user using the memo form at **340**, and saved or sent as an email attachment.

Paging Services

The subscriber may select the hypertext link option **400** seen on the main menu of FIG. **2** to display a form as seen in FIG. **11** to control paging services. The subscriber enters the phone number of his or her paging service (see **85** in FIG. **1**) in the input line box at **422**. Using the checkboxes and radio buttons provided on the form of FIG. **11**, the subscriber may designate the conditions under which automatic paging is to occur when incoming voice, fax and email messages are received. The form of FIG. 11 also displays a history list of prior automatically generated paging messages for review by the subscriber using the web connection.

Voice and DTMF Controls

In order to control the host services computer using nothing but a conventional telephone stationset, such as the telephone 38 or 81 seen in FIG. 1, conventional voice command interpreters and dialtone control mechanisms may be employed. These techniques, now in common use in voicemail systems, may be implemented using voice command interpretation and speech recognition software components available from Pure Speech Corp. One widely used voice controlled telephone systems which has enjoyed considerable success is the Wildfire System offered by Wildfire ???.

In addition to the hardware interface products offered by Dialogic, the Generations TSP system marketed by Voicetek Corp., 19 Alpha Rd., Chelmsford, Mass. provides a telephony server platform that bridges telecommunications and mixed-media information processing networks, linking different communications tools including telephones, computers, faxes, speech recognition and speech synthesis components, and providing services for telephony sequencing, physical interfacing activities and telephony functions.

Speech synthesis programs which may be employed to convert text to speech for replay over the telephone voice connection include: ProVoice (V.2.1)/PrimoVox marketed by First Byte (subsidiary of CUC International, Inc.), 19840 Pioneer Ave. Torrance, Calif. 90503, which enables programmers to add synthesized speech to applications, analyzes and translates text into sound descriptors, phonetic language with pitch, duration and amplitude codes needed to produce stress patterns in phrases and sentences. A second speech synthesis product which may be employed is VoxFonts (V.1.0) sold by Voice Information Systems, Inc., 2118 Wilshire Blvd., Ste. 973, Santa Monica, Calif. 90403, which provides a text-to-speech synthesis library of programs that translates ASCII text into digital audio file, supporting Dialogic and other industry standard formats and uses concatenated human speech for natural sound, and allows the user to add translation rules or specify pronunciations for difficult or foreign words.

Software components for handling Fax-To-Voice translation are available from Malibu Software Group, Inc., 23852 Pacific Coast Hwy., Ste. 909, Malibu, Calif., which faxed document to be converted into spoken words. This fax to voice system provides the ability to receive and store fax documents in user's mailbox similar to regular voice mail messages, and incorporates mechanisms for providing security and control of information. Can be integrated with other voice mail systems.

In general, using conventional speech and command recognition, DTMF tone signaling detection, and speech synthesis techniques for sending voice prompts and information to the user, all of the control functions discussed in detail above using the HTML/CGI interface may be replicated using voice controls via the telephone line, permitting the host services computer to be controlled using either the website or the voice interface. Nonetheless, because voice prompts must be presented sequentially and voice response interpretation is similarly cumbersome in many cases, the web interface contemplated by the present invention provides a preferred control mechanism for many functions.

It is to be understood that the embodiment of the invention which has been described is merely illustrative on one application of the principles of the invention. Numerous modifications may be made by those skilled in the art without departing from the true spirit and scope of the invention.

What is claimed is:

1. The method of processing telephone calls on behalf of a subscriber which comprises, in combination, the steps of:

connecting a web browser accessible to said subscriber to the Internet,

connecting a web server to the Internet at a location remote from said web browser,

employing said web browser to submit preference data to said web server via the Internet, said preference data defining the manner in which said subscriber desires to have telephone calls processed,

storing said preference data as submitted in a database,

employing call processing apparatus coupled to said database and to the public switched telephone network for receiving incoming telephone calls directed to said subscriber from said public switched telephone network,

employing said call processing apparatus to forward said incoming telephone calls to one or more telephone numbers designated by said preference data via said public switched telephone network, and

selectively recording voice mail messages from persons originating said incoming telephone calls in a manner specified by said preference data.

2. The method set forth in claim 1 wherein the step of selectively recording voice mail messages includes the step of recording voice mail messages from the originators of incoming calls from selected ones of a set of telephone numbers specified by said preference data.

3. The method set forth in claim 1 further including the step of transmitting a listing of said voice mail messages to a remote user from said web server, employing said web server to accept a selection of one of said voice mail messages from said remote user, and thereafter transmitting to said remote user an audio file containing the voice mail message designated by said selection.

4. The method set forth in claim 1 further including the step of employing voice recognition means for translating a selected one of said voice mail messages into a file of text data and for transmitting said file of text data to a destination in a manner specified by said preference data.

5. A The method set forth in claim 4 wherein said file of text data is transmitted in an email message to an email address specified in said preference data.

6. The method set forth in claim 1 wherein at least some of said incoming telephone calls are facsimile transmissions and wherein the step of employing said call processing apparatus to forward said incoming telephone calls includes the step of converting said content into a MIME file attachment transmitted by email to an email address specified by said preference data.

7. The method set forth in claim 1 wherein at least some of said incoming telephone calls are facsimile transmissions and wherein the step of employing said call processing apparatus to forward said incoming telephone calls further includes the steps of establishing a voice mailbox storage system for storing messages recorded by the originators of said incoming calls, employing fax-to-voice means for converting the content of specified ones of said fax messages into voice data, and storing said voice data in said voice mailbox storage system.

8. The method set forth in claim 1 wherein at least some of said incoming telephone calls are facsimile transmissions

and wherein the step of employing said call processing apparatus to forward said incoming telephone calls further includes the steps of employing character recognition means for converting the content of specified ones of said fax messages into text data and transmitting said text data to a designated destination in a manner designated by said preference data

9 The method set forth in claim **8** wherein said step of transmitting said text data comprises transmitting said text data in the content of an email message to an email address specified by said preference data

10 The method set forth in claim **1** further comprising the step of transmitting a paging message to said subscriber upon the receipt of selected incoming calls in a manner specified by said preference data

11. The method set forth in claim **1** further including the step of establishing a voice connection via the Internet for

forwarding at least some of said incoming calls to a designated computer in a manner specified by said preference data.

12. The method set forth in claim **11** further including the step of first attempting to forward at least given ones of said incoming calls via an Internet connection to a designated computer accessible to said subscriber and, when said Internet connection is unavailable, forwarding said given ones of said incoming calls via the public switched telephone network to one or more telephone numbers as specified by said preference data

13 The method set forth in claim **1** wherein said step of forwarding said incoming calls further comprises the step of altering the forwarding destination for said incoming calls at chronological times specified by said preference data

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